

CLAIMS

1. An ionic liquid type functional material comprising an aromatic compound which has a fluorine-containing ether chain and is
5 represented by the formula (1):



wherein -D- is a fluoroether unit represented by the formula (1-1):

10



in which R is at least one selected from divalent fluorine-containing alkylene groups having 1 to 5 carbon atoms in which at least one of
15 hydrogen atoms is replaced by fluorine atom; n is an integer of from 1 to 20, and when m is not less than 2, two or more of D may be the same or different;

Ra is a monovalent organic group which has 1 to 20 carbon atoms and does not contain said D, and when m is not less than 2, two or more of
20 Ra may be the same or different;

m is an integer of from 1 to 4;

Ry is a mono-, di-, tri- or tetra-valent organic group having 2 to 30 carbon atoms which has at least one selected from basic functional groups Y¹ and/or salts Y² of the basic functional groups and contains
25 an aromatic ring structure,

provided that a unit of -O-O- is not contained in said formulae (1) and (1-1).

2. The ionic liquid type functional material of Claim 1,
wherein in said formula (1), -O-R- in -D- has at least one kind of
fluoroether unit selected from the group consisting of -(OCFZ¹CF₂)-,
-(OCF₂CF₂CF₂)-, -(OCH₂CF₂CF₂)-, -(OCFZ²)-, -(OCZ³₂)-, -(CFZ¹CF₂O)-,
5 -(CF₂CF₂CF₂O)-, -(CH₂CF₂CF₂O)-, -(CFZ²O)- and -(CZ³₂O)-, wherein Z¹
and Z² are the same or different and each is H, F or CF₃; Z³ is CF₃.

3. The ionic liquid type functional material of Claim 1 or 2,
wherein Ra is selected from fluorine-containing alkyl groups Rx having
10 1 to 20 carbon atoms.

4. The ionic liquid type functional material of Claim 1 or 2,
wherein Ra is a monovalent organic group Ry' having 2 to 20 carbon
atoms which has at least one selected from the basic functional groups
15 Y¹ and/or the salts Y² of the basic functional groups and contains an
aromatic ring structure.

5. The ionic liquid type functional material of any of Claims
1 to 3, wherein the basic functional group or the salt of the basic
20 functional group contained in said Ry is at least one kind selected from
amines, imines, enamines, ketimines, azines and salts thereof.

6. An ionic liquid type functional material comprising a
fluorine-containing polymer represented by the formula (M-1):

wherein the structural unit M1 is at least one selected from structural units derived from ethylenic monomers having, in a side chain thereof, a moiety represented by the formula (2):

5



in which $-D^1-$ is a fluoroether unit represented by the formula (2-1):

10



15

wherein R^1 is at least one selected from divalent fluorine-containing alkylene groups having 1 to 5 carbon atoms in which at least one of hydrogen atoms is replaced by fluorine atom; $n1$ is an integer of from 1 to 20; Ry^1 is a monovalent organic group having 2 to 30 carbon atoms which has at least one selected from basic functional groups Y^1 and/or salts Y^2 of the basic functional groups and contains an aromatic ring structure, provided that a unit of $-O-O-$ is not contained in the structural unit M1 and the formula (2-1); the structural unit A1 is a structural unit derived from a monomer being copolymerizable with the monomer being capable of providing the structural unit M1, and the structural units M1 and A1 are contained in amounts of from 1 to 100 % by mole and from 0 to 99 % by mole, respectively.

20

25 7. An ionic liquid type functional material comprising a fluorine-containing polymer represented by the formula (M-2):



wherein the structural unit M2 is a structural unit derived from an ethylenic monomer having, in its side chain, a moiety represented by the formula (3):

$$5 - Ry^2 + D^1 - Ra^1]_{m1} \quad (3)$$

in which Ry^2 is a di-, tri- or tetra-valent organic group having 2 to 30 carbon atoms which has at least one of basic functional groups Y^1 and/or salts Y^2 of the basic functional groups and contains an aromatic ring structure; Ra^1 is a monovalent organic group which has 1 to 20 carbon atoms and does not contain D^1 , and when $m1$ is not less than 2, two or more of Ra^1 may be the same or different; $m1$ is an integer of from 1 to 3; $-D^1-$ is selected from the same units as defined in the formula (2) of Claim 6, and when $m1$ is not less than 2, two or more of D^1 may be the same or different, provided that a unit of $-O-O-$ is not contained in the structural unit $M2$ and the formulae (2-1); the structural unit $A2$ is a structural unit derived from a monomer being copolymerizable with the monomer being capable of providing the structural unit $M2$, and the structural units $M2$ and $A2$ are contained in amounts of from 1 to 100 % by mole and from 0 to 99 % by mole, respectively.

8. The ionic liquid type functional material of Claim 7,
wherein Ra¹ is selected from fluorine-containing alkyl groups Rx¹
having 1 to 20 carbon atoms.

9. The ionic liquid type functional material of any of Claims

6 to 8, wherein the basic functional group Y¹ or the salt Y² of the basic functional group contained in said Ry¹ and Ry² is at least one kind selected from amines, imines, enamines, ketimines, azines and salts thereof.

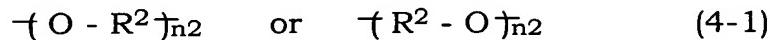
5

10. An aromatic compound which has a fluorine-containing ether chain and is represented by the formula (4):



10

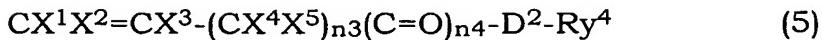
wherein -D²- is a fluoroether unit represented by the formula (4-1):



15 in which R² is at least one selected from divalent fluorine-containing alkylene groups having 1 to 5 carbon atoms in which at least one of hydrogen atoms is replaced by fluorine atom; n2 is an integer of from 1 to 20, and when m2 is not less than 2, two or more of D² may be the same or different; Ry³ is a mono-, di-, tri- or tetra-valent organic group
20 having 2 to 30 carbon atoms which has at least one of amines and/or salts of amines and contains an aromatic ring structure; Rx² is a fluorine-containing alkyl group having 1 to 20 carbon atoms, and when m2 is not less than 2, two or more of Rx² may be the same or different; m2 is an integer of from 1 to 4, provided that a unit of -O-O- is not
25 contained in said formulae (4) and (4-1).

11. An aromatic compound which has a fluorine-containing

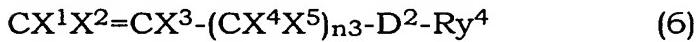
ether chain and is represented by the formula (5):



5 wherein X^1 , X^2 , X^4 and X^5 are the same or different and each is hydrogen atom or fluorine atom; X^3 is selected from hydrogen atom, fluorine atom, CH_3 and CF_3 ; $n3$ and $n4$ are the same or different and each is 0 or 1; Ry^4 is a monovalent organic group having 2 to 30 carbon atoms which has at least one of amines and/or salts of amines
10 and contains an aromatic ring structure; D^2 is as defined in the formula (4) of Claim 10.

12. The aromatic compound of Claim 11 which has a fluorine-containing ether chain and is represented by the formula (6):

15



wherein X^1 , X^2 , X^3 , X^4 , X^5 , $n3$, D^2 and Ry^4 are as defined in said formula (5).

20

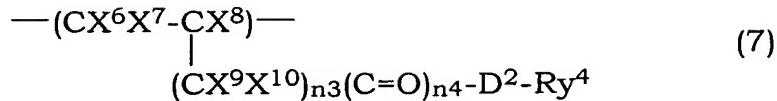
13. A fluorine-containing polymer which has a number average molecular weight of from 500 to 1,000,000 and is represented by the formula (M-3):

25



wherein the structural unit M3 is a structural unit represented by the

formula (7):



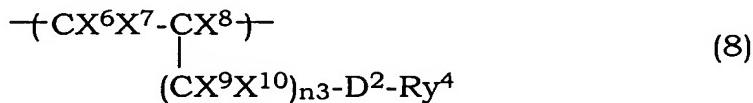
5

wherein X^6 , X^7 , X^9 and X^{10} are the same or different and each is hydrogen atom or fluorine atom; X^8 is selected from hydrogen atom, fluorine atom, CH_3 and CF_3 ; $n3$ and $n4$ are the same or different and each is 0 or 1; D^2 and Ry^4 are as defined in the formula (5) of Claim 10 11; the structural unit A3 is a structural unit derived from a monomer being copolymerizable with the monomer being capable of providing the structural unit M3, and the structural units M3 and A3 are contained in amounts of from 1 to 100 % by mole and from 0 to 99 % by mole, respectively.

15

14. The fluorine-containing polymer of Claim 13, wherein the structural unit M3 is a structural unit represented by the formula (8):

20



wherein X^6 , X^7 , X^8 , X^9 , X^{10} , $n3$, D^2 and Ry^4 are as defined in the formula (7).